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10/707,058	11/18/2003	Meng-Jey YOUH	14610	1057

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EXAMINER	
CANNING, ANTHONY J	

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2879	

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Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No. 10/707,058	Applicant(s) YOUH ET AL.	
	Examiner Anthony J. Canning	Art Unit 2879	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☐ Responsive to communication(s) filed on _____.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-23* is/are pending in the application.

4a) Of the above claim(s) *19-23* is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-18* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☒ Claim(s) *1-23* are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *18 November 2003* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date *2/26/04*.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: _____.

DETAILED ACTION

Election/Restrictions

Restriction to one of the following inventions is required under 35 U.S.C. 121:

I. Claims 1-18, drawn to the method of making a field emission display, classified in class 427, subclass 77.

II. Claims 19-23, drawn to a field emission array, classified in class 313, subclass 495.

The inventions are distinct, each from the other because of the following reasons:

Inventions I and II are related as process of making and product made. The inventions are distinct if either or both of the following can be shown: (1) that the process as claimed can be used to make other and materially different product or (2) that the product as claimed can be made by another and materially different process (MPEP § 806.05(f)). In the instant case the method of fabricating can be performed by a materially different process, such as using chemical vapor deposition to deposit the masking material, instead of spraying.

During a telephone conversation with Robert Rose on 6 July 2005 a provisional election was made with traverse to prosecute the invention of the method of making a field emission display, claims 1-18. Affirmation of this election must be made by applicant in replying to this Office action. Claims 19-23 are withdrawn from further consideration by the examiner, 37 CFR 1.142(b), as being drawn to a non-elected invention.

Applicant is reminded that upon the cancellation of claims to a non-elected invention, the inventorship must be amended in compliance with 37 CFR 1.48(b) if one or more of the currently named inventors is no longer an inventor of at least one claim remaining in the

application. Any amendment of inventorship must be accompanied by a request under 37 CFR 1.48(b) and by the fee required under 37 CFR 1.17(i).

Claim Objections

Claim 4 is objected to because of the following informalities: LaB6 should be written with 6 as a subscript so that it reads LaB_6 . Appropriate correction is required.

Claim Rejections - 35 USC § 102

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

Claims 1, 5-10, 17 and 18 are rejected under 35 U.S.C. 102(b) as being anticipated by Jin et al. (U.S. 6,250,984 B1).

As to claim 1, Jin et al. disclose a method of manufacturing a triode field emission cold cathode device having randomly distributed field emission emitters (see Figs. 5D and 6, item 70; column 4, lines 42-43; the nanotubes are oriented randomly) including the steps of: providing a substrate (see Fig. 6, item 76; column 11, lines 58-60); depositing a first conductive layer on the substrate (see Fig. 6, item 75; column 11, lines 59-60); spraying the preceding layer with a random pattern of masking material (see Fig. 6, item 70; column 11, lines 44-49, lines 56-57; the use of spray and sprinkling of the masking material allows random placement of masking particles); depositing an insulating layer on the masked preceding layer (see Fig. 6, item 73;

column 11, lines 49-51, lines 58-60); depositing a second conductive layer on the insulting layer (see Fig. 6, item 74; column 11, lines 51-52, line 59); and removing the masking material (column 11, lines 61-64).

As to claim 5, Jin et al. disclose the method of claim 1, where the masking material can be dissolved in water or solvents. Jin et al. disclose that plastic particles can be used as the masking material (column 11, lines 44-46). Various solvents, such as Tetrahydrofuran and Dimethyformamide, and water dissolve plastics. Water dissolves plastics at a slower rate than most solvents.

As to claim 6, Jin et al. disclose the method of claim 1, wherein the masking material is a form of solid particles (column 11, lines 44-46).

As to claim 7, Jin et al. disclose the method of claim 1, wherein the masking material is photosensitive material, plastic, glass, metal or ceramic particles (column 11, lines 44-46). Specifically Jin et al. disclose that the masking particles can be metal, ceramic or plastic.

As to claim 8, Jin et al. disclose the method of claim 1, wherein the spraying step includes dusting, sprinkling, or smoking (column 11, lines 48-49). Jin et al. specifically disclose sprinkling.

As to claim 9, Jin et al. disclose the method of claim 1, further including the step of depositing a catalyst layer on the first conductive layer (see Fig. 4, item C; see Fig. 5D, items 54, 56, and 58; column 10, lines 7-20; the electrically conductive metal pad described in lines 17-20 is interpreted by the examiner as the conductor on the substrate), prior to the spraying step (the growth of carbon nanotubes happens before the growth of insulator and gate electrode layers; see Fig. 4, items C and G), for growing an emitter material.

As to claim 10, Jin et al. disclose the method of claim 9, wherein the catalyst layer is Ni, Cu, Ag, Co, Fe, or diamond-seeded film (column 6; lines 6-10, lines 47-53).

As to claim 17, Jin et al. disclose a method of manufacturing a triode field emission cold cathode device having randomly distributed field emission emitters (see Figs. 5D and 6, item 70; column 4, lines 42-43; the nanotubes are oriented randomly) including steps for: randomly masking conductive material (see Fig. 6, item 70; column 11, lines 44-49, lines 56-57; the use of spray and sprinkling of the masking material allows random placement of masking particles); and removing the masking material (column 11, lines 61-64).

As to claim 18, Jin et al. disclose a method of manufacturing a triode field emission cold cathode device having randomly distributed field emission emitters (see Figs. 5D and 6, item 70; column 4, lines 42-43; the nanotubes are oriented randomly) including the steps of: spraying a conductive layer with a random pattern of masking material (see Fig. 6, item 70; column 11, lines 44-49, lines 56-57; the use of spray and sprinkling of the masking material allows random placement of masking particles); and removing the masking material (column 11, lines 61-64).

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which the subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

Claims 2-4, 11, 12, and 15 are rejected under 35 U.S.C. 103(a) as being unpatentable over Jin et al. (U.S. 6,250,984 B1) in view of Chang et al. (U.S. 2003/0044537 A1).

As to claim 2, Jin et al. disclose the method of claim 1. Jin et al. fail to teach a step of depositing an emitter material after the removing step.

Chang et al. disclose the method for manufacturing a carbon nanotube field emission display including a step of depositing an emitter material after removing the masking material (see Figs. 2E, 2F, and 2G; paragraphs 0024 and 0025). Forming the emitter material after the removal of the mask will keep from damaging the emitter material while removing the masking material.

Therefore, it would have been obvious to one having ordinary skill in the art, at the time the invention was made, to modify the method of manufacturing a field emission display of Jin et al. to include a step of forming the emitter material after the step of removing the masking material, as taught by Chang et al., to avoid damaging the emitter material during the removal of the mask.

As to claim 3, Jin et al. and Change et al. disclose the method of claim 2. Jin et al. further disclose that depositing the emitter material is accomplished by spin coating (column 10, lines 22-24).

As to claim 4, Jin et al. and Change et al. disclose the method of claim 2. Jin et al. further disclose that the emitter material is carbon nanotubes (column 1, lines 7-9).

As to claim 11, Jin et al. disclose the method of claim 1. Jin et al. fail to disclose that the first conductive layer includes a hardening material and further including the step of hardening the first conductive layer.

Chang et al. fail to disclose that the first conductive layer includes a hardening material (paragraph 0021, silver that is sintered is a hardening material) and further including the step of hardening the first conductive layer (paragraph 0021, sintering[1] is a form of hardening my coalescing particles). Hardening the conductive layer via sintering fuses the metal particles, which creates a better conductor.

Therefore, it would have been obvious to one having ordinary skill in the art, at the time the invention was made, to modify the method of manufacturing a field emission display of Jin et al. to include a first conductive layer with a hardening material with a step of hardening the conductive material, as taught by Chang et al., for the added benefit of creating a better conductive layer.

As to claim 12, Jin et al. and Chang et al. disclose the method of claim 11. Chang et al. further disclose that the hardening material is a metal-containing compound, specifically silver (paragraph 0021). Silver is a good metal to choose because of its conductive properties.

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[1] to bring about agglomeration in (metal particles) by heating

Therefore, it would have been obvious to one having ordinary skill in the art, at the time the invention was made, to modify the method of manufacturing a field emission display of Jin et al. to include a conductor with a hardening material, which is a metal-containing compound, as taught by Chang et al., for the added benefit of silver's conductive properties.

As to claim 15, Jin et al. and Chang et al. disclose the method of claim 11. Chang et al. further disclose that the hardening step is performed by sintering. Sintering is a way to fuse particles without melting them, which could avoid damage of the device by high temperatures. Sintering is a technique that is performed in an oven, which is radiation curing.

Therefore, it would have been obvious to one having ordinary skill in the art, at the time the invention was made, to modify the method of manufacturing a field emission display of Jin et al. to include a hardening step done by radiation curing, as taught by Chang et al., so that the temperature of the metal is not raised so high as to be melted, thereby preventing potential damage of the device caused by heating.

Claim 16 is rejected under 35 U.S.C. 103(a) as being unpatentable over Jin et al. (U.S. 6,250,984 B1) in view of Sun et al. (U.S. 2002/0160111 A1).

As to claim 16, Jin et al. disclose the method of claim 1. Jin et al. fail to teach a step of depositing a photosensitive layer, exposing the photosensitive layer, and developing the photosensitive layer.

Sun et al. disclose a method for manufacturing a field emission display with a step of depositing a photosensitive layer (see Fig. 4a, item 405; paragraph 0038), exposing the photosensitive layer (see Fig. 4b; paragraph 0038), and developing the photosensitive layer (see

Fig. 4d, paragraph 0038). The photosensitive layer is used to aid in the selective growth of the carbon nanotube layer (paragraph 0038).

Therefore, it would have been obvious to one having ordinary skill in the art, at the time the invention was made, to modify the method of manufacturing a field emission display of Jin et al. to include a step of depositing a photosensitive layer, exposing the photosensitive layer, and developing the photosensitive layer, as taught by Sun et al., for the added benefit of selective growth of carbon nanotubes.

Claims 13-14 are rejected under 35 U.S.C. 103(a) as being unpatentable over Jin et al. (U.S. 6,250,984 B1) in view of Chang et al. (U.S. 2003/0044537 A1) and in further view of Sun et al. (U.S. 2002/0160111 A1).

As to claim 13, Jin et al. and Chang et al. disclose the method of claim 11. Jin et al. and Chang et al. fail to disclose that the hardening material is prepared by a sol-gel method.

Sun et al. disclose a method of manufacturing a field emission display including a hardening material on the conductor layer (see Fig. 2, item 203; paragraph 0036, lines 2-4; the hardening material in this case is the catalyst material), which is prepared by sol-gel technique (paragraph 0014, lines 1-12). Sun et al. further disclose that the catalyst material, prepared by sol-gel technique, is used as a catalyst for carbon nanotube growth (paragraph 0014, lines 1-3).

Therefore, it would have been obvious to one having ordinary skill in the art, at the time the invention was made, to modify the method of manufacturing a field emission display of Jin et al. to include a hardening material, such as a catalyst material, prepared by a sol-gel method, as taught by Sun et al., to act as a catalyst for carbon nanotube growth.

As to claim 14, Jin et al. and Chang et al. disclose the method of claim 11. Jin et al. and Chang et al. fail to disclose that the hardening material is a mixture of conductive powders and polymers. Chang et al. do disclose that a hardening material can be prepared from a conductive powder (paragraph 0021, silver that is sintered is a hardening material; sintering[2] by definition is the agglomeration of a powder; the examiner considers silver particles as a powder). The silver particles, once sintered form a better electrical connection

Sun et al. disclose a method of manufacturing a field emission display including a hardening material with a metal and a polymer (paragraph 0014). The polymer is used as a hydrocarbon precursor (paragraph 0014), for carbon nanotube growth.

Therefore, it would have been obvious to one having ordinary skill in the art, at the time the invention was made, to modify the method of manufacturing a field emission display of Jin et al. to include a hardening material including a metal powder and a polymer, as taught by Chang et al. and Sun et al., for the added benefit of good conductivity and a precursor for carbon nanotube growth.

Prior Art

The prior art made of record and not relied upon is considered pertinent to applicant's disclosure.

Choi (U.S. 2002/0197752 A1) teach a method for manufacturing a field emission display with a step of applying carbon nanotube emitters using a metal powder and organic binder which is sintered to anchor the carbon nanotubes.

[2] Sintering is a method for making objects from powder

Contact Information

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Anthony J. Canning whose telephone number is (571)-272-2486. The examiner can normally be reached on M-F 8:00-4:30.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Nimesh D. Patel can be reached on (571)-272-2457. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

Anthony Canning

7 July 2005

ASHOK PATEL
PRIMARY EXAMINER